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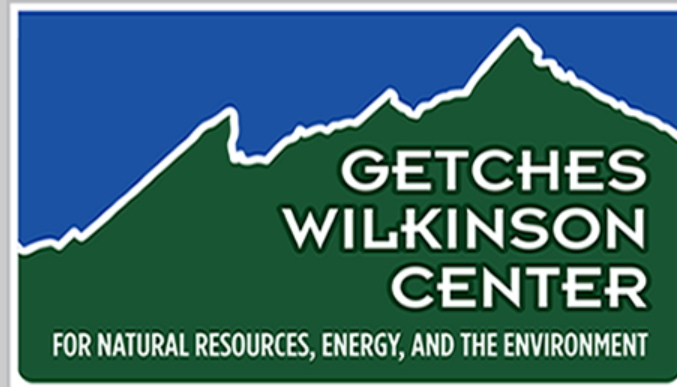
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PRIORITIZING MANAGEMENT AND PROTECTION OF THE COLORADO RIVER'S ENVIRONMENTAL RESOURCES

(FEBRUARY, 2016)

The Colorado River is one of North America's greatest natural assets. Flowing from "the land of snow to the land of sun," in the words of John Wesley Powell, the river provides water and hydroelectricity to 40 million people. Parts of the river network are also superlative for their natural wonder. Grand Canyon and other national parks and monuments of the Colorado Plateau comprise the densest concentration of protected lands in the lower 48 states, and the reservoirs of the watershed are recreational playgrounds. Many of the native fish in the mainstem occur nowhere else on Earth. And the delta of the Colorado River, characterized by Aldo Leopold in the 1920s as "The Green Lagoons," was once among the most biologically diverse places on the continent.

For many of us who live in the Southwest, the Colorado River not only provides the water and electricity necessary to meet our needs, but also provides beauty and inspiration that sustains and enriches our lives. It is therefore critical that the natural assets of the Colorado River be given equal footing with other uses in decisions about river management. But they are not. In our single-minded effort to maximize consumptive use of the basin's waters, we have radically altered the natural environment, leaving many components of the basin ecology on life support. Too often, environmental efforts focus on palliative measures required by laws such as the Endangered Species Act and the Clean Water Act, doing little to restore and maintain the river's necessary ecological functions.

There are a number of large environmental mitigation programs in place across the basin: namely, the Upper Colorado River Endangered Fish Recovery Program and the San Juan River Basin Recovery Implementation Program in the basin's headwaters; the Glen Canyon Dam Adaptive Management Program focused on the Grand Canyon segment of the river; the Lower Colorado Multi-Species Conservation Program focused on the highly altered segment between Hoover Dam and Yuma; and the Minute 319 binational planning and monitoring effort concerned with the dewatered delta that is primarily in Mexico. All of these environmental programs provide value in protecting specific native species, protecting native ecosystems, creating novel ecosystem mixes of native and nonnative species, or rehabilitating valued river landscapes within each program's specific geographic area. These programs are, nevertheless, an incomplete patchwork of largely uncoordinated efforts, existing in some cases to facilitate compliance with environmental laws that might otherwise constrain users from withdrawing additional water from the river system.¹ Comprehensive restoration of the entire river network requires cultivation of a basin-scale vision and strategy for environmental management integrated within emerging strategies concerning water allocation and hydropower production.

¹ While our focus in this document is primarily on these large-scale efforts, it is worth noting that many worthwhile environmental programs exist at smaller scales.

Deficiencies to Address in Colorado River Environmental Management

There are two significant, long-standing deficiencies of these prominent Colorado River environmental programs.² First, some of these programs feature mutually incompatible objectives, such as the Desired Future Conditions of the Glen Canyon Dam Adaptive Management Program that call for reestablishment of extirpated fish species, maintenance of a trophy fishery of introduced rainbow trout, re-creation of a river corridor landscape that matches natural conditions, and maintenance or increase in Glen Canyon Dam's hydroelectricity generating capacity. In the upstream watershed, the purpose of the Upper Colorado River Endangered Fish Recovery Program is to recover populations of endangered fish "while water use and development continues,"³ even though ecosystem recovery is severely challenged by the physical realities of greatly altered flow regimes, large stream-flow depletions in some places, sediment-trapping by large reservoirs, altered temperature regimes, and invasive species. In many cases, recovery of natural resources to pre-development conditions is incompatible with the existence and operations of the massive constructed plumbing system of the Colorado River.

Second, the Colorado is a single system of highly interrelated components; it is a river, and should be managed as such for all of its societal and environmental benefits. In most cases, the river is not managed in this way—and this is by design. At the heart of current Colorado River management are laws, policies, dams, and aqueducts that divide the flow of the river into many discrete allocations and rights. The current strategy is politically motivated by the desire to minimize interstate and binational competition for limited water supplies, while simultaneously empowering states and local water managers with the legal certainty and autonomy necessary to support the management of their water allocation. Environmental programs evolved later around this pre-existing framework, with most efforts focused on modifying the operations, or mitigating the impacts, of the basin's physical infrastructure. An unintended result is a framework that often impedes the search for coordinated management strategies.

Elements of a More Effective Approach

In recent years, the benefits of "basin-scale" thinking have increasingly been recognized, and have opened the door to innovative and broadly beneficial programs such as the Basin Study, Minute 319, and the System Conservation Program.⁴ This is an encouraging trend but it is occurring primarily from the

² For program descriptions, see: Upper Colorado River Endangered Fish Recovery Program, <http://www.coloradoriverrecovery.org>; San Juan River Basin Recovery Implementation Program, <http://www.fws.gov/southwest/sjrip/>; Glen Canyon Dam Adaptive Management Program, <http://www.gcdamp.gov/>; and Lower Colorado River Multi-Species Conservation Program, <http://www.lcrmscp.gov/>. A useful summary of the 319 Binational Monitoring Program (by Karen Schlatter, Sonoran Institute) is available at: http://www.lcrmscp.gov/crtr/presentations/2014/13_crtr2014.pdf.

³ <http://www.coloradoriverrecovery.org/>

⁴ *The Colorado River Basin Water Supply and Demand Study* (2012) identified projected water supply and demand imbalances on the system out to 2060, and analyzed a suite of strategies for resolving those imbalances; see <http://www.usbr.gov/lc/region/programs/crbstudy.html>. The *Minute 319* agreement between the US and Mexico provides for new cooperative efforts on infrastructure development, reservoir operations, and water deliveries—including flows to the delta; see <http://www.usbr.gov/lc/region/feature/minute319.html>. The *Colorado River System Conservation Program* provides up to \$11 million in funding over two years to develop and implement pilot programs in water conservation, with saved water returned to the overall river system; see

perspective of a single lens: maximizing the ability of the constructed plumbing system to satisfy existing and projected off-stream, consumptive uses of water. Despite some notable recent exceptions—the 2014 pulse flow released into the delta being the most prominent—the notion that integrated, basin-wide management can be the vehicle for achieving pragmatic environmental objectives is still an idea with limited on-the-ground application.

An important step forward would be to encourage basin-scale coordination of the aforementioned environmental programs. One simple step would be to establish recurring cross-program meetings of key managers and researchers.⁵ These meetings should not merely be a vehicle for providing scientific updates and sharing management stories. These meetings should be guided by a precisely defined series of questions designed to identify opportunities for coordinated management action that might achieve basin-scale environmental goals. These meetings could also prompt broadly focused efforts to revisit and potentially expand environmental objectives consistent with existing program goals, explore joint administrative frameworks for linking programs, consider new funding mechanisms⁶, and other innovations.

We appreciate that important policy considerations and the need for stakeholder consensus constrain how the objectives of these programs are defined, but there should be room to augment the existing efforts in environmental recovery with strategic considerations about which river resources are most appropriately protected or recovered in different segments of the river. The tools to achieve these desired environmental objectives will differ from place to place.⁷ Clearly, conversations about where and how to pursue river restoration in different parts of the basin should be guided by stakeholder values and informed by scientific analyses and economic considerations. It is appropriate to consider where available restoration funds can have the most impact, and where expanded investments might be valuable.

Other activities could also prove beneficial, such as additional efforts to modify dam operations or the further evolution of the System Conservation Program, perhaps to include development of mechanisms to better shepherd water downstream. The exact shape or form all these efforts will or should take requires considerably more analysis and stakeholder discussion; we will return to this topic in future publications. For now, we observe that this is an area that demands more serious attention if river management is to better align with the full range of public values.

<http://www.denverwater.org/docs/assets/61EEE5E6-E088-F78F-01A6F8E15E876D51/ColoradoRiverSystemConservationProgramSummary.pdf/>.

⁵ Such a meeting ought to be informed by the immense amount of science that is conducted today in different parts of the basin. One such effort occurred in 2008 in Scottsdale, Arizona. (See: Melis, T.S., Hamill, J.F., Bennett, G.E., Coggins, L.G., Jr., Grams, P.E., Kennedy, T.A., Kubly, D.M., and Ralston, B.E., eds., 2010. *Proceedings of the Colorado River Basin Science and Resource Management Symposium*, November 18-20, 2008, Scottsdale, Arizona. USGS Scientific Investigations Report 2010-5135, 372 p. <http://pubs.usgs.gov/sir/2010/5135/>.)

⁶ The funding mechanisms differ for each program, but many share a heavy reliance on federal hydropower revenues. There's no reason that the "cash register" dams that have funded much of the environmental damage on the system cannot be more extensively tapped to fund the river's restoration and ongoing protection.

⁷ The reality is that the Colorado River presents diverse opportunities and constraints for environmental restoration. For example, directly upstream from Lake Mead, there is relatively abundant stream flow, and the environmental challenges are associated with the effects of peaking flows for electricity production and the associated changes in sediment supplies and other water quality parameters. Downstream from Hoover Dam, half of the once-navigable river has been converted to reservoirs and many other parts of the river are confined in levees. Downstream from Mexico's Morelos Dam, the river is typically dry.

Conclusion

When it comes to achieving environmental goals in the Colorado River Basin, we cannot have it all, but we can have something different and better than the existing patchwork of programs. More attention to how we incorporate environmental issues into a more integrated set of programs offers an improved, more cost-effective, way to avoid undesirable trade-offs and conflicts. Fifteen years of drought, lower river flows, overconsumption, and diminished reservoir storage highlights the need to innovate and improve management.

There are several reasons to be optimistic. Despite the fact that a lack of water is a chronic concern in the lower parts of the river, especially downstream from Laguna Dam, many areas in the upstream watershed that are highly valued for their environmental and recreational attributes have reliable in-stream flows.⁸ The availability of relatively large volumes of stream flow in the downstream parts of the river network are likely to continue indefinitely, because Lower Basin and Mexican water rights pull water downstream to the border. Similarly, while much of the lower river is significantly degraded, large parts of the river upstream are comparatively healthy or, with reasonable efforts, could be restored to health. Additionally, while there is considerable room to improve the focus and integration of the big environmental programs, the very fact that these programs and the environmental regulations that guide them already exist means we have an established body of personnel, expertise, and funding streams to draw upon. Thus, we do not need to be satisfied with small, isolated environmental successes; we can achieve big successes. But it will require additional strategic thinking.

In some river segments, comprehensive rehabilitation or recovery is possible; at a minimum, critically important pockets of healthy and undisturbed habitat can be restored everywhere. We envision a linked series of healthy environments throughout the channel network—predominantly featuring native species and ecosystem processes where practicable. In places like the delta, these healthy environments might resemble an emerald necklace of biodiversity. In the upper basin, the recovered river might begin to resemble the broad channels and backwaters where the native fish species originated. But achieving a healthier river environment means choosing our battles carefully, spending our money wisely, and coordinating our efforts carefully. The process we envision enlists sound science in service to a basin-scale environmental vision articulated by the public, and a game plan that acknowledges existing constraints in law, funding, and tradition.

So how, in practice, do we achieve this? This will likely be a task that requires work on several fronts, and will by necessity build upon the many valuable efforts already in place. The successful efforts will likely be more incremental than abrupt and disruptive; more cooperative than coercive. But most importantly, these efforts must recognize that environmental quality should be on an equal footing with the other objectives of river management.

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⁸ Of course, simply allocating water for nature will not do the job by itself; active management of flows, physical habitats, vegetation, and species populations is required.